TITLE

STEERING WHEEL MOUNTING HUB

CROSS-REFERENCE TO RELATED APPLICATION

This application claims the benefit of U.S. provisional patent application serial no. 60/326,933 filed October 4, 2001.

BACKGROUND OF THE INVENTION

The present invention relates generally to an apparatus for mounting a steering wheel and, in particular, to a hub for mounting a steering wheel on a shaft.

Prior art mounting hubs, used for boats, golf carts, lawn tractors and the like, typically are mounted on a center shaft and the steering wheel is attached to the hub, generally using bolts or screws. The mounting hub is typically constructed of a cast metal material such as aluminum and the center shaft is typically constructed of a steel alloy. These prior art cast metal mounting hubs have disadvantages in that the mounting hub is subject to corrosion, particularly in a salt water environment. The corrosion occasionally freezes the mounting hub onto the center shaft, making it impossible to remove or, in a worst case scenario, can result in failure of the steering wheel hub.

The prior art cast metal mounting hub is heavy and disadvantageously requires painting for appearance purposes after being manufactured. In addition, the prior art mounting hub often requires a secondary manufacturing process whereby threads are inserted into the cast metal mounting hub to accept a bolt or screw to attach the steering wheel thereto. Alternatively, the prior art hub requires an inefficient assembly process where the steering wheel is bolted onto the mounting hub.

It is desirable, therefore, to provide a hub for mounting a steering wheel on a shaft that is lightweight, is corrosion resistant, is cost effective to manufacture, and does not require painting after being manufactured.

SUMMARY OF THE INVENTION

The present invention concerns a steering wheel mounting hub formed as a plastic injection molded component, which has widespread application in marine environments, and in other applications such as for golf carts, lawn tractors, etc.

The hub for mounting a steering wheel on a shaft in accordance with the present invention includes a plastic injection molded frustum-shaped body having a generally planar upper surface of a predetermined first diameter and an opposed generally planar lower surface of a predetermined second diameter larger than the first diameter. The upper surface is adapted to receive a plurality of fasteners for attaching a steering wheel thereto. A mounting bore extends through the body between the upper surface and the lower surface, and defines an inner surface that is adapted to receive a center or steering shaft.

Preferably, the plastic material used for the mounting hub body is formed of a fiber reinforced plastic, an acetyl co-polymer or similar plastic material. Because plastic is inherently weaker than aluminum or other cast metal materials, the composition of the plastics used and the design of the mounting hub have both required innovation to make it possible to replace the cast metal mounting hubs of the prior art with the plastic material mounting hub according to the present invention.

The plastic steering wheel mounting hub according to the present invention is approximately three times lighter than the cast metal mounting hubs of the prior art, has a lower cost than the mounting hubs of the prior art, and is corrosion resistant, which is particularly important in a salt-water marine environment. The plastic material of the mounting hub is operable to allow the steering wheel to be mounted by self-tapping screws, which is a less expensive assembly technique than bolting a steering wheel onto the mounting hub or developing a secondary manufacturing process whereby threads are inserted into the mounting hubs to accept a bolt or screw.

Furthermore, the plastic steering wheel mounting hub in accordance with the present invention can be colored to suit prior to injection molding and thus requires no painting after being manufactured. The plastic mounting hub also has the ability to be recycled, which an aluminum part, if heavily corroded, does not.

DESCRIPTION OF THE DRAWINGS

The above, as well as other advantages of the present invention, will become readily apparent to those skilled in the art from the following detailed description of a preferred embodiment when considered in the light of the accompanying drawings in which:

Fig. 1 is a top plan view of a steering wheel mounting hub in accordance with the present invention;

Fig. 2 is cross-sectional view of the hub shown in Fig. 1 taken along the line 2-2;

Fig. 3 is an exploded cross-sectional view of the hub shown in Fig. 1 taken along the line 3-3 and shown with a steering wheel, shaft, and fasteners;

Fig. 4 is a perspective view of the top of the hub shown in Fig. 1;

Fig. 5 is a perspective view of the bottom of the hub shown in Fig. 1; and

Fig. 6 is a top plan view of a steering wheel mounting hub in accordance with an alternate embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

There is shown in the Figs. 1-6 a steering wheel mounting hub **10** formed as a plastic injection molded component with a frustum-shaped body **11** having a generally planar upper surface **12** of a predetermined first diameter and an opposed generally planar lower surface **13** of a predetermined second diameter larger than the first diameter. The upper surface **12** is adapted to be attached to a steering wheel **27**, best seen in Fig. 3, discussed in more detail below. The lower surface **13** is adapted to receive a shaft **25**, such as a steering column shaft or the like, best seen in Fig. 3, discussed in more detail below. A plurality of arcuate slots **14** are formed in the body **11** open to the upper surface **12** and equally spaced about the periphery of the upper surface. A plurality of fastener apertures **15** are formed in the body **11** open to the upper surface **12** and equally spaced about the periphery of the upper surface. The slots **14** and the apertures **15** are alternated and are located a predetermined radial distance from a longitudinal axis **16** of the body **11**. Preferably, the apertures **15** are dimensioned to receive self-tapping threaded screws or fasteners **29**, best seen in Fig. 3, for attaching the steering wheel **27** to the upper surface **12**. The plastic material of the mounting hub **10** allows the steering wheel **27** to be mounted by the self-tapping screws **29**, which is a less expensive assembly technique than the prior art technique of bolting a steering wheel onto the mounting hub **10** or developing a secondary manufacturing process whereby threads (not shown) are formed in the mounting hub to accept a bolt or screw. Alternatively, the apertures **15** are dimensioned to receive any type of fastener such as screws, bolts, and the like for attaching the steering wheel to the upper surface **12**. The slots **14** are formed

in the body **11** to reduce the weight of and the amount of plastic material required for the body **11**.

Preferably, the plastic material used for the mounting hub body **11** is formed of a fiber reinforced plastic such as a 33% glass reinforced nylon 66, available from DuPont Engineering Polymers of Wilmington, Delaware. Other suitable plastic materials for the body **11** include, but are not limited to, an acetyl co-polymer or similar plastic material. The hub **10** according to the present invention meets or exeeds the static and dynamic load requirements set out by the American Boat & Yacht Council, advantageously making the plastic material mounting hub **10** a replacement of suitable strength for the cast metal mounting hub as well as suitable for use in marine environments.

A generally cylindrical center recess **17** is formed in the body **11** open to the upper surface **12** and centered on the axis **16**. The recess **17** is not as deep as either the slots **14** or the apertures **15**. A mounting bore **18** is formed in the body **11** centered on the axis **16** and extends from a bottom wall of the recess **17** to the lower surface **13**. The bore **18** is tapered in a manner similar to the outside of the body **11** to receive an end of a steering shaft (not shown). Extending radially outwardly from the bore **18** are a plurality of vertically extending grooves **19** for receiving, for example, splines (not shown) on the shaft. Alternatively, referring to Fig. 6, a plurality of vertically extending grooves **19a** form a different profile and extend outwardly from the bore **18a** for receiving a shaft (not shown) having splines with a star-shaped profile suitable for coupling the steering wheel to the shaft. The radially outwardly extending grooves **19a** are generally V-shaped and form a star pattern as shown in Fig. 6 although any suitable pattern of grooves can be used.

As best shown in Figs. 2 and 5, an annular recess **20** is formed in the body **11** open to the bottom surface **13** and extending between a central boss **21** and an outer wall **22**. The recess **20** is formed to reduce the weight of and the amount of plastic material required for the body **11**. A plurality of equally spaced ribs **23** extends radially between the boss **21** and the wall **22** to strengthen the body **11**. The ribs **23** divide the recess **20** into a plurality of segments each having an arcuate slot **24** formed in a bottom wall of the recess.

Referring now to Fig. 3, the mounting hub **10** is shown in exploded view with the tapered shaft **25** having a threaded free end, a retaining nut **26**, the steering wheel **27**, and a plurality of self-tapping threaded fasteners **29**. The steering wheel **27** includes a

generally planar mounting portion or center disk **28** for mating with the upper surface **12** of the mounting hub **10**. The shaft **25** preferably extends from a steering column (not shown). The threaded free end of the shaft **25** is inserted in the bore **18** and secured to the body **11** by the nut **26**. The outer surface of the shaft **25** preferably includes a plurality of splines **31** extending outwardly therefrom for cooperating with the grooves **19** on the mounting hub body **11**. The nut **26** is preferably dimensioned to fit in the recess **17** to prevent the shaft **25** and the mounting hub **10** from rotating relative to one another, in conjunction with the grooves **19** and the splines **31**. The center disk **28** of the steering wheel **27** mates with the upper surface **12** and the steering wheel **27** is secured to the body **11** by the fasteners **29**, which each engage with the interior surface of a corresponding aperture **15** in the upper surface **12**. The steering wheel **27** and the mounting hub **10**, when attached with the fasteners **29**, form a steering wheel assembly, indicated generally at **30**.

The plastic steering wheel mounting hub **10** according to the present invention is approximately three times lighter than the cast metal mounting hubs of the prior art, has a lower manufacturing cost than the mounting hubs of the prior art, and is corrosion resistant, which is particularly important in a salt-water marine environment. Furthermore, the plastic steering wheel mounting hub **10** in accordance with the present invention can be colored to suit prior to injection molding and thus requires no painting after being manufactured. The plastic mounting hub **10** also has the ability to be recycled, which an aluminum part, if heavily corroded, does not.

In accordance with the provisions of the patent statutes, the present invention has been described in what is considered to represent its preferred embodiment. However, it should be noted that the invention can be practiced otherwise than as specifically illustrated and described without departing from its spirit or scope.